pressed down, thus supporting the weight attached to the other end. This downward pressure is evidently a muscular effort, even though the movement was only a few millimeters; and the resulting values seem to indicate a greater sensibility than the pure pressure-sense would give. By having three such beams, all three of the methods used with visual impressions could be applied to this kind of touch sensations. The pressures were varied from 1 gramme to 2000 grammes. The results expressed, as those with sensations of brightness, are as follows: (1) The sensibility increases as the stimulus increases up to about 200 grammes, and from there to 2000 grammes is quite constant. (2) The sensibility is finer (*a*) with successive than with simultaneous impressions; (*b*) when muscular sensibility is added to pressure sensations, than without the latter; (*c*) when the same finger is used for the various sensations than when different fingers are used; (*d*) when the surface in contact is small than when it is large—these points holding for all the methods of experimentation as well. (3) In the method of doubles, the ratios assigned as the double decrease as the stimuli increase. (4) By the method of mean gradations, the adjustments are much nearer the arithmetical than the geometrical mean. (5) On the basis of the relativity hypothesis, and assuming that with the sensation of 1 gramme all the stimulus is converted into sensation, then from 200 to 2000 grammes only .114 to .163 of it is thus converted; and a not very different result is obtainable from the other two methods when the effects of contrast are eliminated.

This research is thus in opposition to several of the accepted generalizations of psychophysics, and though some of this antagonism is more apparent than real, it will be a most delicate and difficult work to bring unity and harmony into this most perplexing field of experimental psychology. J. J.

Ueber den Rhythmus centraler Reize. Dr. R. v. LIMBECK. Archiv für experimentelle Pathologie, Bd. XXV, H. 2.

The author has reopened the question of the rhythm of muscular contractions following central stimulation. Using induction shocks and recording the results graphically, he stimulated the cortex in dogs and rabbits and the cord in rabbits and frogs directly, and the cord in frogs, toads, rabbits and doves reflexly, stimulating the N. ischiadicus on one side so as to cause contractions on the other. In contradiction to the hitherto accepted view, he found that the central system did not send out motor impulses at a fixed rate, no matter how fast stimuli were sent into it, but that, within the limits of experiment, as many impulses were sent out as were received. His rates were for the cortex 6½–13 per sec., for the cord 5½–34, and for the same by reflex stimulation 4½–19½. Faster rates, when applied, gave smooth curves. Tracings of the spontaneous tetanus of strychnine poisoning showed a variable rate of central discharge.

Ein photometrischer Apparat zu psychophysischen Zwecken. A. KIRSCHMANN. Philosophische Studien, V, 2, 1888, pp. 292–301.

Owing to the difficulties in the accurate observation of differences of sensations of brightness, such as contrast, differences in sensibility of neighboring parts of the retina, variations in accommoda-

tion, not to mention mechanical difficulties, Kirschmann devoted himself to securing a method of comparing luminosities free from such defects. He lays down two principles: (1) that the two surfaces to be compared must be equally distant from the eye of the observer, and if possible, in the same plane; (2) the two surfaces must be in contact. A tube 20 cm. in diameter, coated inside with lamp-black, and adjustable to a length of 60–100 cm., furnishes a dark chamber. In front of this a rotation-apparatus sets in motion a disk 21 cm. in diameter, just covering the opening of the tube. This disk has two quadrants white; and in the others a band of black or gray, and concentric with it an opening through which one sees into the tube. Both these are regulated in quantity by an adjustable portion of a disk attached over them. The object now is to make the black band equal in intensity to the black of the tube seen through the openings. If the opening is $a°$ wide and the black band $b°$, and the reflecting power of the black is called 1, of the white x, and of the tube 0, then $(360-a)x=b+(360-b)x$, or $x=\frac{b}{b-a}$. This is under the supposition that the tube reflects no light, which is not strictly true. If we call the slight light coming from the tube with an opening of $1°=k$, then the corrected formula is $(360-a)x+a^2k=b+(360-b)x$. And if in another case the settings are a_1 and b_1 degrees; then $(360-a_1)x+a_1{}^2k=b_1+(360-b_1)x$; from which the two unknown quantities k and x can be found. So slight, however, is this value of k (estimates make it less than 1/5700 or 1/6800 of the reflection from white cardboard), that it is not detectable in the general result. A comparison of a band of "*Pariser Schwartz*" with white cardboard by this method gave a ratio of 1 to 66.2, which agrees well with 1 to 68, found by Lehmann. Continual use seems to increase the power of reflection of black; making the ratio in one case 1 to 51.2. Similar measurements gave with lamplight a ratio of 1/60 (for black to white); with gas-light 1/58.2, and with diffused daylight 1/57.2. These differences are probably due to the impurity of the white of the cardboard. The following table of comparison with white cardboard of substances usually employed to produce black may be interesting:

	Lamplight.	Diffused daylight.
Paris black,	1/60	1/57.2
Indian ink,	1/23.6	1/20.2
Indigo,	1/26.8	1/27
Graphite (Faber BB),	1/8.6	1/8.9
" (" B),	1/6.2	1/5.9

This apparatus seems to be satisfactory and commends itself to various uses. J. J.

IV.—ABNORMAL.

De la Paralysie Générale d'origine traumatique. B. Ball. L'Encéphale, July, 1888.

Paralysie Générale d'origine traumatique. L. F. Arnaud. L'Encéphale, November, 1888.

Prof. Ball reports three interesting cases of general paralysis of traumatic origin, and such cases are so rare as to merit special comment. The first was a postal employé who was thrown against the